
**Tractors and machinery for agriculture and
forestry — Serial control and
communications data network —**

**Part 7:
Implement messages application layer**

iTeh STANDARD PREVIEW

*Tracteurs et matériels agricoles et forestiers — Réseaux de commande et
de communication de données en série —*

Partie 7: Couche d'application de base

ISO 11783-7:2002

<https://standards.iteh.ai/catalog/standards/sist/14a354ac-3f33-4963-82eb-8e74f1eac5f0/iso-11783-7-2002>



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ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.ch
Web www.iso.ch

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Contents

Page

Foreword	v
Introduction.....	vi
1 Scope.....	1
2 Normative references.....	1
3 General requirements and recommendations	2
3.1 General.....	2
3.2 Signal characterization.....	2
3.3 Message format.....	2
3.4 Implement configuration offsets	4
Annex A (normative) Parameter definitions.....	5
A.1 Time (UTC)	5
A.2 Date.....	5
A.3 Local minute offset	6
A.4 Local hour offset	6
A.5 Ground-based speed	6
A.6 Ground-based distance.....	6
A.7 Ground-based direction.....	7
A.8 Wheel-based speed.....	7
A.9 Wheel-based distance.....	7
A.10 Wheel-based direction	7
A.11 Key switch state	8
A.12 Maximum time of tractor power	8
A.13 Maintain ECU power.....	8
A.14 Maintain actuator power.....	9
A.15 Implement transport state	9
A.16 Implement park state	9
A.17 Implement work state.....	10
A.18 Navigation parameters.....	10
A.19 Hitch parameters	10
A.20 PTO parameters.....	13
Annex B (normative) Parameter groups.....	68
B.1 Time/Date	68
B.2 Ground-based speed and distance	68
B.3 Wheel-based speed and distance.....	69
B.4 Maintain power	69
B.5 Navigation system messages	70
B.6 Secondary or front hitch status.....	70
B.7 Primary or rear hitch status	71
B.8 Secondary or front PTO output shaft.....	71
B.9 Primary or rear PTO output shaft	72
B.10 Hitch and PTO commands.....	73
B.11 Auxiliary valve 0 estimated flow	73
B.12 Auxiliary valve 0 measured flow.....	74
B.13 Auxiliary valve 0 command	74
B.14 Auxiliary valve 1 to 14 messages	75
B.15 Auxiliary valve 15 estimated flow	77
B.16 Auxiliary valve 15 measured flow.....	77
B.17 Auxiliary valve 15 command	78
B.18 Lighting command	78

B.19	Lighting data	80
B.20	Background lighting level command	81
B.21	Language command.....	82
B.22	Flexible repetition rates	83
B.23	Working set master	84
B.24	Process data message.....	85
B.25	Tractor remote control messages	86
Annex C	(informative) Tractor control messages — Examples	92
C.1	Cruise control	92
C.2	Combined constant PTO speed and cruise control.....	92
C.3	Auxiliary valve slip control with guidance.....	93
C.4	Combined constant PTO speed and cruise control with guidance	94
Bibliography	96

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[ISO 11783-7:2002](https://standards.iteh.ai/catalog/standards/sist/14a354ac-3f33-4963-82eb-8e74f1eac5f0/iso-11783-7-2002)

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

ISO 11783-7 was prepared by Technical Committee ISO/TC 23, *Tractors and machinery for agriculture and forestry*, Subcommittee SC 19, *Agricultural electronics*.

ISO 11783 consists of the following parts, under the general title *Tractors and machinery for agriculture and forestry — Serial control and communications data network*:

- Part 1: General standard for mobile data communication
- Part 2: Physical layer
- Part 3: Data link layer
- Part 4: Network layer
- Part 5: Network management
- Part 6: Virtual terminal
- Part 7: Implement messages application layer
- Part 8: Power train messages
- Part 9: Tractor ECU
- Part 10: Task controller and management information system data interchange
- Part 11: Data dictionary

Annexes A and B form a normative part of this part of ISO 11783. Annex C is for information only.

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Introduction

Parts 1 to 11 of ISO 11783 specify a communications system for agricultural equipment based on the CAN 2.0 B [1] protocol. SAE J 1939 [2] documents, on which parts of ISO 11783 are based, were developed jointly for use in truck and bus applications and for construction and agriculture applications. Joint documents were completed to allow electronic units that meet the truck and bus SAE J 1939 specifications to be used by agricultural and forestry equipment with minimal changes. General information on ISO 11783 is found in ISO 11783-1.

The purpose of ISO 11783 is to provide an open interconnected system for on-board electronic systems. It is intended to enable electronic units to communicate with each other providing a standardized system.

The International Organization for Standardization (ISO) draws attention to the fact that it is claimed that compliance with this part of ISO 11783 may involve the use of patent concerning the controller area network (CAN) protocol referred to throughout the document.

ISO takes no position concerning the evidence, validity and scope of this patent.

The holder of this patent has assured ISO that he is willing to negotiate licences under reasonable and non-discriminatory terms and conditions with applicants throughout the world. For this purpose, the statement of the holder of this patent is registered with ISO. Information may be obtained from:

Robert Bosch GmbH
Wernerstraße 51
Postfach 30 02 20
D-70442 Stuttgart-Feuerbach
Germany

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Attention is drawn to the possibility that some of the elements of this part of ISO 11783 may be the subject of patents other than that those identified above. ISO shall not be held responsible for identifying any or all such patent rights.

Tractors and machinery for agriculture and forestry — Serial control and communications data network —

Part 7: Implement messages application layer

SAFETY PRECAUTIONS — Caution is to be taken with any automatic control of implements carried out using a message defined in this part of ISO 11783. See ISO 11783-9 for safe-mode operations.

1 Scope

This part of ISO 11783 specifies a serial data network for control and communications on forestry or agricultural tractors and mounted, semi-mounted, towed or self-propelled implements. Its purpose is to standardize the method and format of transfer of data between sensor, actuators, control elements, and information-storage and -display units, whether mounted on, or part of, the tractor or implement. This part of ISO 11783 describes the implement messages application layer of the network, specifying the message set and defining the messages used for communication with and between tractors and connected implements.

2 Normative references

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The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of ISO 11783. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of ISO 11783 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 639 (all parts), *Codes for the representation of names of languages*

ISO 11783-1:—¹⁾, *Tractors and machinery for agriculture and forestry — Serial control and communications data network — Part 1: General standard for mobile data communication*

ISO 11783-3, *Tractors and machinery for agriculture and forestry — Serial control and communications data network — Part 3: Data link layer*

ISO 11783-6:—¹⁾, *Tractors and machinery for agriculture and forestry — Serial control and communications data network — Part 6: Virtual terminal*

ISO 11783-9, *Tractors and machinery for agriculture and forestry — Serial control and communications data network — Part 9: Tractor ECU*

ISO 11783-10:—¹⁾, *Tractors and machinery for agriculture and forestry — Serial control and communications data network — Part 10: Task controller and management information system data interchange*

1) To be published.

ISO 11783-11:—¹⁾, *Tractors and machinery for agriculture and forestry — Serial control and communications data network — Part 11: Data dictionary*

IEC 61162-3:—¹⁾ *Maritime navigation and radiocommunication equipment and systems — Digital interfaces — Part 3: Serial data instrument network*

3 General requirements and recommendations

3.1 General

The message set specified by this part of ISO 11783 is designed to support the basic needs of an implement for information from a tractor, as well as limited controls enabling coordination between implement and tractor. The message set supports messages containing information on

- time,
- ground speed,
- distance,
- navigation,
- PTO parameters,
- three-point hitch,
- general process data, and
- lighting function parameters

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Messages are regularly repeated at fixed intervals.

The message parameters are defined in annex A; the parameter groups are specified in annex B.

See annex C for examples of tractor control messages.

3.2 Signal characterization

The ISO 11783 network has been designed with the intent of providing current data from an electronic control unit (ECU) to and for use by other ECUs on the network.

It is recommended that the time between physical data acquisition of a signal and the transmission of the data not exceed twice the repetition rate defined for the data.

3.3 Message format

3.3.1 General

The ISO 11783 network message format uses the parameter group number as the label for a group of parameters. Each parameter within the group can be expressed as characters, as scaled data defined by the ranges given in 3.3.3, or as function states consisting of one or more bits. Characters are transmitted with the left-most character first.

Numerical parameters consisting of two or more data bytes shall be transmitted least significant byte first.

3.3.2 Data type

Each parameter is identified as being of either the command or measured data type.

- Command data specifies the desired state of a multi-state parameter, function or numerical value of a set point as requested by a transmitting ECU. Specific confirmation of a command is not necessarily assured. For example, the command may request that a solenoid be activated, yet no measurement be taken to ensure the solenoid has accomplished its function.

EXAMPLE 1 Engage power take-off (PTO), extend auxiliary valve state, activate headlight high-beam, rear hitch position set point.

- Measured data conveys the current value of a parameter, as measured or observed by the transmitting ECU, determining the condition of the defined parameter.

EXAMPLE 2 Ground-based speed, hitch position, PTO engagement, implement position.

3.3.3 Parameter ranges

Table 1 defines the ranges used to determine the validity of a transmitted signal, Table 2 those ranges used to denote the state of a discrete parameter, and Table 3 those used to denote the state of a control mode command. The values in the range “error indicator” provide the means for an ECU to immediately indicate that valid parametric data are not currently available due to some type of error in the sensor, subsystem or ECU.

If an ECU failure prevents transmission of valid data for a parameter, the appropriate error indicator given in Table 1 or 2 should be used in place of that parameter's data. However, if the measured or calculated data has yielded a value that is valid, yet which exceeds the defined parameter range, the error indicator should not be used. The data should be transmitted using the appropriate minimum or maximum parameter value. If the sensor cannot determine if the measured or calculated data is valid, it shall send the error indicator.

ISO 11783-7:2002

3.3.4 Adding to parameter groups

Several of the parameter groups contain bytes that are undefined and which may be replaced with new parameters defined by ISO at a future date. If existing parameter group definitions do not permit the inclusion of new parameters, then a new parameter group may be defined.

See ISO 11783-1 for additional definitions and the abbreviations of instructions for requesting that parameters be added to parameter groups and new parameter group numbers be created.

Table 1 — Transmitted signal ranges

Range name	1 byte	2 bytes	4 bytes	ASCII
Valid signal	0 to 250 00 ₁₆ to FA ₁₆	0 to 64 255 0000 ₁₆ to FAFF ₁₆	0 to 4 211 081 215 00000000 ₁₆ to FAFFFFFF ₁₆	1 to 254 01 ₁₆ to FE ₁₆
Reserved range for future indicator bits	251 to 253 FB ₁₆ to FD ₁₆	64 256 to 65 023 FB00 ₁₆ to FDFF ₁₆	4 211 081 216 to 4 261 412 863 FB000000 ₁₆ to FDFFFFFF ₁₆	none
Error indicator	254 FE ₁₆	65 024 to 65 279 FExx ₁₆	4 261 412 864 to 4 278 190 079 FExxxxxx ₁₆	0 00 ₁₆
Not available, not installed or not requested	255 FF ₁₆	65 280 to 65 535 FFxx ₁₆	4 278 190 080 to 4 294 967 294 FFxxxxxx ₁₆	255 FF ₁₆

Table 2 — Transmitted values for discrete parameters (measured)

Range name	Transmitted value
Disabled (Off, passive, etc.)	00
Enabled (On, active, etc.)	01
Error indicator	10
Not available or not installed	11

Table 3 — Transmitted values for control commands

Range name	Transmitted value
Command to disable function (turn Off, etc.)	00
Command to enable function (turn On, etc.)	01
Reserved	10
Don't care/take no action (leave function as is)	11

3.4 Implement configuration offsets

The configuration of a tractor–implement connection, and the offset to and from the tractor and implement reference points, are used in the navigational parameters and in the implement configuration of process data messages. See ISO 11783-10.

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Annex A (normative)

Parameter definitions

A.1 Time (UTC)

Data length:	3 bytes
Resolution:	Byte 1 = 0,25 s/bit, 0 s offset Byte 2 = 1 min/bit, 0 min offset Byte 3 = 1 h/bit, 0 h offset
Operating range:	Byte 1 = 0 to 59,75 s Byte 2 = 0 min to 59 min Byte 3 = 0 h to 23 h

Type:

Measured

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A.2 Date

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Data length:	3 bytes
Resolution:	Byte 1 = 1 month/bit, 0 month offset Byte 2 = 0,25 d/bit, 0 day offset Byte 3 = 1 y ² /bit, + 1985 year offset
Operating range:	Byte 1 = 1 month to 12 months Byte 2 = 0,25 d to 31,75 d Byte 3 = + 1985 (year) to + 2 235 (year)
Type:	Measured

NOTE A value of 0 for the month (byte 1) is null. The value 1 identifies January, 2 identifies February, etc. A value of 0 for the day (byte 2) is null. The values 1, 2, 3 and 4 are used to identify the first day of the month; 5, 6, 7 and 8 identify the second day of the month etc. A value of 0 for the year (byte 3) identifies the year 1985; a value of 1 identifies 1986, etc.

2) The SI unit for "year" (annum) is a.

A.3 Local minute offset

Local time offset in minutes from a reference time (UTC).

Data length:	1 byte
Resolution:	1 min/bit, 0 min offset
Operating range:	0 min to 59 min
Type:	Measured

A.4 Local hour offset

Local time offset in hours from a reference time (UTC).

Data length:	1 byte
Resolution:	1 h/bit, – 24 h offset
Operating range:	– 24 h to 23 h
Type:	Measured

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A.5 Ground-based speed

Actual groundspeed of a machine, measured by a sensor such as radar.

Data length:	2 bytes
Resolution:	0,001 m/s/bit, 0 m/s offset; upper byte resolution = 0,256 m/s/bit
Data range:	0 m/s to 64,255 m/s
Type:	Measured

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A.6 Ground-based distance

Actual distance travelled by a machine based on measurements from a sensor such as radar.

When distance exceeds 4 211 081,215 m, the value should be reset to zero and incremented as additional distance accrues.

Data length:	4 bytes
Resolution:	0,001 m/bit
Data range:	0 m to 4 211 081,215 m
Type:	Measured

A.7 Ground-based direction

Measured signal indicating either forward or reverse as the direction of travel.

When speed is zero, indicate the last travel direction until a different direction is detected.

Data length: 2 bits

Value	Meaning
00	Reverse
01	Forward
10	Error indication
11	Not available

Type: Measured

A.8 Wheel-based speed

Value of the speed of a machine as calculated from the measured wheel or tail shaft speed.

Data length: 2 bytes

Resolution: 0,001 m/s/bit, 0 m/s offset

upper byte resolution = 0,256 m/s/bit

Data range: 0 m/s to 64,255 m/s

Type: Measured

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A.9 Wheel-based distance

Distance travelled by a machine as calculated from wheel or tail-shaft speed.

When distance exceeds 4 211 081,215 m, the value should be reset to zero and incremented as additional distance accrues.

Data length: 4 bytes

Resolution: 0,001 m/bit

Data range: 0 m to 4 211 081,215 m

Type: Measured

A.10 Wheel-based direction

Measured signal indicating either forward or reverse as the direction of travel.

When speed is zero, indicate the last travel direction until a different direction is detected or selected and engaged.

Data length: 2 bits

Value	Meaning
00	Reverse
01	Forward
10	Error indication
11	Not available

Type: Measured

A.11 Key switch state

Indicates the key switch state of the tractor or power unit.

This does not indicate unforeseen power interruptions such as those caused by starting the engine.

Data length: 2 bits

Value	Meaning
00	Key switch Off
01	Key switch not Off
10	Error indication
11	Not available

Type: Measured

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A.12 Maximum time of tractor power

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Maximum time of remaining tractor or power unit supplied electrical power at the current load.

This parameter may be estimated rather than being a measured value.

Data length: 1 byte

Resolution: 1 min/bit, 0 offset

Data range: 0 to 250

Type: Measured

A.13 Maintain ECU power

Request to the Tractor ECU to maintain ECU_PWR power for the next 2 s.

Data length: 2 bits

Value	Meaning
00	No further requirement for ECU_PW
01	Requirement for 2 s more of ECU_PWR
10	Reserved
11	Don't care

Type: Command

A.14 Maintain actuator power

Request to the Tractor ECU to maintain PWR power for the next 2 s.

Data length: 2 bits

Value	Meaning
00	No further requirement for PWR
01	Requirement for 2 s more for PWR
10	Reserved
11	Don't care

Type: Command

A.15 Implement transport state

Indicates the transport state of an implement connected to a tractor or power unit.

Data length: 2 bits

Value	Meaning
00	Implement may not be transported
01	Implement may be transported
10	Error indication
11	Not available

Type: Measured
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 ISO 11783-7:2002

A.16 Implement park state

Indicates the state of an implement where it may be disconnected from a tractor or power unit.

Data length: 2 bits

Value	Meaning
00	Implement may not be disconnected
01	Implement may be disconnected
10	Error indication
11	Not available

Type: Measured